

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554**

In the Matter of	)	
	)	
Revision of Part 15 of the Commission's Rules to	)	ET Docket No. 13-49
Permit Unlicensed National Information	)	
Infrastructure (U-NII) Devices in the 5 GHz Band	)	

To: The Commission

**COMMENTS OF ERICSSON**

Ericsson hereby submits these comments in response to the Commission's *Notice of Proposed Rulemaking* ("Notice")<sup>1</sup> which seeks comment on amending the Commission's Part 15 rules governing unlicensed operations in the 5 GHz band and making additional 195 MHz of spectrum available for Unlicensed National Information Infrastructure ("U-NII") use.

**INTRODUCTION**

Ericsson supports the Commission's and Congress's goals of making wider swaths of spectrum available for U-NII use through technical rule changes, and adding to the total inventory of spectrum available for U-NII use. Specifically, Ericsson firmly supports the expansion of unlicensed access to the 5350-5470 MHz and 5850-5925 MHz bands on a technology-neutral basis<sup>2</sup> that encourages innovation, technological development, and investment. Access to the band should not be limited by the technology employed; rather it

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<sup>1</sup> Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band, Et Docket No. 13-49, *Notice of Proposed Rulemaking*, FCC 13-22, 28 FCC Rcd 1769 (Feb. 20, 2013).

<sup>2</sup> Among other possibilities, these bands could provide for advanced and cost-efficient backhauling of small cells (pico) and integrated Wi-Fi in heterogeneous networks.

should be open to any technology that meet the Commission's U-NII rules. Ericsson urges the Commission to move as quickly as possible to take advantage of the opportunity to address the growing demand for additional low-powered unlicensed spectrum.

While Ericsson may be better known for its licensed mobile broadband products and services, we actively promote the use of Wi-Fi in heterogeneous networks. Wi-Fi networks are consistently high performing owing to their inherent small-cell architecture and their use of widely available unlicensed spectrum.<sup>3</sup> With the acquisition of BelAir Networks,<sup>4</sup> Ericsson has added to our portfolio of technologies that integrate Wi-Fi with cellular, and that strengthen our heterogeneous network offering. Ericsson is also an industry leader in offering carrier-grade Wi-Fi equipment.

To help address mobile network congestion, Ericsson has developed the first 802.11ac access point designed to enable mobile operators to deliver supplemental small cell or stand-alone Wi-Fi. Recently, Ericsson further cemented its reputation as a leader in integrating unlicensed and licensed technologies by announcing an industry-first feature: real-time traffic steering.<sup>5</sup> This steering technology assesses key performance indicators in the mobile network and the carrier Wi-Fi network before dynamically shifting a user's smartphone connection between those networks. This enhances the user experience by providing a better quality of service in capacity-constrained areas, while avoiding the experience some smartphone users have

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<sup>3</sup> See *Achieving carrier-grade Wi-Fi in the 3GPP world*, ERICSSON REVIEW, Dec. 15, 2012, at 3, available at [http://www.ericsson.com/res/thecompany/docs/publications/ericsson\\_review/2012/er-seamless-wi-fi-roaming.pdf](http://www.ericsson.com/res/thecompany/docs/publications/ericsson_review/2012/er-seamless-wi-fi-roaming.pdf).

<sup>4</sup> See Press Release, *Ericsson completes acquisition of BelAir Networks*, Apr. 2, 2012, available at <http://www.ericsson.com/news/1598985>.

<sup>5</sup> See, Press Release, *Ericsson brings carrier-grade Wi-Fi to mobile broadband*, May 21, 2013, available at <http://www.ericsson.com/news/1703217>.

felt when being automatically connected to a Wi-Fi network only to face a noticeably slower connection.

Ericsson requests that the Commissioners and Commission staff consider the following as the Commission moves forward with its rulemaking:

- If deemed absolutely necessary to protect incumbents, can be cost effectively implemented, and utilize patterns whose parameters are carefully and completely defined, then Ericsson would accept dynamic frequency selection (DFS)/sensing techniques for U-NII equipment. Reliable detection at low signal levels is difficult to guarantee and false detection causes undue link stability problems for U-NII equipment.
- Ericsson recommends that the need for a geo-location database-oriented approach to spectrum management be studied further, but such study should not delay adding to the inventory of U-NII spectrum at 5 GHz or change existing rules.<sup>6</sup>
- For all devices operating in the U-NII bands, Ericsson urges the Commission to consider introducing technology neutral mechanisms to promote harmonious operation in the bands, possibly including etiquettes or other techniques that enable use of the band in a spectrally efficient fashion to try to prevent the “tragedy of the commons” that has occurred at 2.4 GHz.
- Finally, Ericsson urges that harmonization with other markets be considered to the greatest degree possible to encourage equipment economies of scale. The Notice seeks comment about the relationship between international spectrum planning at the World Radiocommunication Conference in 2015 (“WRC-15”) and this proceeding’s consideration of the technical requirements for this spectrum.<sup>7</sup> Ericsson posits that the ideal manner for the Commission to further the U.S. position at WRC-15 is to move this proceeding forward expeditiously; developing domestic approaches to sharing that can be shared at WRC-15 in furtherance of America’s global leadership with respect to the 5 GHz band.

The Commission’s leadership will be important both in creating a balance between protecting incumbent users of the band and creating a robust market for unlicensed use of the band and in assuring that unlicensed users can coexist amongst themselves in the band.

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<sup>6</sup> Ericsson recognizes the importance of protecting federal and licensed systems from harmful interference, while allowing unlicensed use. On one incumbent deployment of geo-location databases does give certainty of access for the U-NII device to a band. However, the relative benefits of introducing database-aided approaches in the U-NII band have to be balanced against the cost and deployment complexity of implementing geo-location capabilities into U-NII network equipment.

<sup>7</sup> See Notice at ¶ 81.

## DISCUSSION

Ericsson encourages the Commission to move expeditiously to provide access to spectrum wherever possible. With regard to the 5 GHz band, we urge the Commission to facilitate use of the band as quickly as possible. Delaying access to additional spectrum while deliberating *all* of the issues raised in the Notice would only serve to postpone the benefits that could be realized if the Commission defers more complex issues for resolution at a later date. As the Notice rightly points out,<sup>8</sup> some issues raised in this rulemaking may require additional record development in the form of sharing studies. However, as indicated, *infra*, by our proposals for the U-NII-1, -2A, -2C, and -3 bands, the Commission can make certain determinations in the near-term, thus allowing some benefits of additional spectrum to flow sooner rather than later.

With the foregoing as a backdrop, Ericsson offers the following comments to specific issues raised in the Notice.

### **1. Unlicensed Operations in U-NII-3 Band**

Ericsson supports the Commission's proposal to extend the U-NII-3 band from 5.825 GHz to 5.850 GHz to match the amount of spectrum available under Section 15.247 of the Commission's rules.<sup>9</sup> Ericsson also supports the Commission's proposal to consolidate equipment authorizations in the 5.725-5.850 GHz band under the U-NII rules (Section 15.407) and to remove 5.725-5.850 GHz band devices from Section 15.247.<sup>10</sup> This will ensure efficiencies, with all equipment operating under consistent technical rules.

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<sup>8</sup> See *id.* at ¶¶ 102-112.

<sup>9</sup> See *id.* at ¶ 27.

<sup>10</sup> See *id.* at ¶ 28.

With respect to Sections 15.247 and 15.407, Ericsson supports removing the bandwidth-dependent term  $-17 + 10 \log B$  – from Section 15.407, in order to align with the 1 Watt total peak conducted power measurement contained in Section 15.407.<sup>11</sup> Ericsson agrees with the Commission’s analysis that removing the variable power limit will not increase the potential for interference.

Ericsson also supports a maximum Power Spectral Density (PSD) of 33 dBm/MHz and emission bandwidth (6-dB bandwidth of 500 kHz) requirements per 15.247 in order to offer the greatest amount of internal harmony in the rules, and thus facilitate the creation of larger channel widths. Similarly, Ericsson also supports the adoption of the more stringent antenna gain (23 dBi maximum), unwanted emissions (-17 / -27 dBm/MHz), and peak to average ratio (no more than 13 dB across 1 MHz) requirements per Section 15.407.

## **2. Unlicensed Operations in the U-NII-1 Band**

To permit the introduction of devices with consistent technical specifications across 200 MHz of contiguous spectrum, Ericsson recommends that the Commission harmonize rules for the U-NII-1 and U-NII-2A bands.<sup>12</sup> Specifically, Ericsson supports (1) increasing the power limits to 250 mW with a maximum EIRP of 30 dBm with 6 dBi antenna gain; (2) increasing the PSD limits to 11 dBm/MHz; and (3) eliminating the restriction on outdoor operation, using power and PSD limits rules consistent with the U-NII-2 band.

To the extent possible, the Commission should strive to provide U-NII devices access to the broadest possible swath of contiguous spectrum under harmonized rules that will

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<sup>11</sup> See *id.* at ¶ 30.

<sup>12</sup> See *id.* at ¶ 39.

accommodate the evolution towards substantially wider channel bandwidths and the efficiency and greater throughput which results from those wider channels.

### **3. Ensuring Compliance with the Rules for the U-NII Bands**

Ericsson shares the Commission's concerns that end users should not be able to easily modify devices operating in U-NII bands. Doing so, as the Commission states, can result in in- and out-of-band emissions, causing interference to incumbent users.<sup>13</sup> As detailed below, Ericsson supports adding security measures to devices. Ericsson does not, however, support bringing *all* digitally modulated devices under a rule – specifically, Section 15.407 – that would require use of DFS outside of those bands in which DFS is already required.<sup>14</sup> Ericsson sees significant benefit in maintaining current bands without DFS requirements for some applications, such as wireless backhaul.

Ericsson supports the Commission's proposal that manufacturers implement security features in devices capable of operating in the U-NII bands, so that third parties cannot reprogram the devices to operate outside the parameters for which they were certified (including country code, frequency range, maximum output power levels and DFS support).<sup>15</sup> While no technology is guaranteed to be “unhackable,” Ericsson's own products are designed to make it difficult for third parties to reprogram certified devices. Ericsson would generally agree with a proposal requiring all manufacturers to take steps to limit the ability of end users or third parties to modify the operating ranges of U-NII devices outside of acceptable parameters.

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<sup>13</sup> See *id.* at ¶¶ 42-47.

<sup>14</sup> See *id.* at ¶ 49.

<sup>15</sup> See *id.* at ¶ 51.

With regard to the specific proposal to render modified devices inoperable, however, Ericsson cautions that such a solution would be excessively complex, requiring locking/encrypting binary images in those devices. We support methods that simply prevent reconfiguration of a device's operating parameters outside of allowable ranges.

Ericsson believes that with the stronger security measures, the Commission's suggestion to have U-NII devices "transmit identifying information . . . to identify the source of interference and its location" should not be necessary. Ericsson further notes that all existing IEEE 802.11 devices today broadcast a "beacon" signal that can be used to aid in identifying the specific source of interference. In the future, more information could be added to that signal, but in many cases information such as geographic coordinates might require user or installer provisioning, which is subject to error and could further complicate U-NII deployment.

Using a geo-location database to avoid interference to Terminal Doppler Weather Radar ("TDWR") may be a potential solution that could be studied further. Ericsson posits that given the small number of TDWR locations, requiring such a database may not be worth the effort, cost, and additional requirements that it would place on U-NII-2C equipment. Other alternative approaches may be better suited to avoid interference into TDWR.

The possibility for a very large, contiguous, U-NII band has great potential to unleash new technologies that, through using very wide channels, can deliver incredible data rates. Ericsson does not support the proposed change in out-of-band emission specifications to 41 dBm/MHz EIRP due to increased device cost and complexity concerns. However, if a -41 dBm/MRZ EIRP is adopted, Ericsson recommends that only the very upper and lower channels (*i.e.*, those abutting 5.150 GHz and 5.925 GHz) be treated as edge channels. Out-of-band

emission requirements of -41 dBm / MHz EIRP should those apply *only* above and below the upper and lower band edge channels, not around other “sub-band” edges where those requirements are placed currently. Throughout the band, again, assuming a uniform power limit, the -27 dBm rule should apply, and, furthermore, should apply to both indoor and outdoor devices.

Finally, Ericsson notes that we do not support rules for U-NII devices to sense radar signals at or exceeding 100 percent of their occupied bandwidth. There is field experience indicating satisfactory performance with detection across less than 100 percent of occupied bandwidth.

#### **4. U-NII-2A and 2C Bands**

As stated above, Ericsson supports stricter measures to limit the ability of end users or third parties to modify devices outside of acceptable operating parameters. With specific regard to devices operating in U-NII-2A and 2C bands, Ericsson supports the Commission’s proposals to require manufacturers to endeavor to prevent disabling DFS mechanisms. Further, Ericsson supports a requirement that any U-NII device subject to the DFS requirements—and that is capable of initiating a network—must employ radar detection functionality and be approved with that capability.<sup>16</sup>

Because of the risk for co-channel interference into TDWR and other radar systems, Ericsson supports the Commission’s proposals to lower the permitted power spectral density (PSD) for lower power devices that use the relaxed sensing threshold in the U-NII-2A and -2C bands.

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<sup>16</sup> See *id.* at ¶ 69.



Finally, Ericsson supports modifying the current rule requiring uniform load spreading over all available channels. Our support of the change is due to the potential for wider bandwidth operations, as well as the ability of master devices to sense channel conditions and move to lower-utilized channels.

## **5. Future Unlicensed Operations at 5 GHz**

Ericsson supports the Commission's proposals to make available an additional 195 MHz of spectrum available in the 5.350-5.470 GHz (U-NII-2B) and 5.850-5.925 GHz (U-NII-4) bands.<sup>17</sup> In Ericsson's view, U-NII-2B band uses would be consistent with the rest of U-NII-1 and 2, *i.e.*, typically (but not restricted to) access to user devices. The new U-NII-4 band, in Ericsson's view, should be consistent with U-NII-3 uses, *i.e.*, typically (but not restricted to) wireless backhaul, including point-to-point, point-to-multipoint and mesh, and non-line-of-sight which is often used in urban settings for deployment of small cells.

Ericsson urges that DFS only be mandated in bands where it is proven to be absolutely necessary.

## **6. Technical Requirements for U-NII-2B Band and U-NII-4 Bands**

At the outset, Ericsson fully embraces the Commission's belief that technical requirements for devices operating in the U-NII-2B and -4 bands should be similar. Maintaining technical consistency across large swaths of spectrum will help to ensure the introduction of devices that can utilize large very large channel sizes to deliver very high data rates.

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<sup>17</sup> See *id.* at ¶ 75.

Regarding the U-NII-2B band, Ericsson agrees with the Commission's proposal to set maximum output power, antenna gain, power spectral density, out-of-band emission, and out-of-channel emission limits consistent across the entire 475 MHz of the band.<sup>18</sup>

Regarding the U-NII-4 Band, Ericsson supports the Commission's proposal apply similar rules across the entire U-NII-3 and -4 bands,<sup>19</sup> but requests that further study be undertaken to evaluate co-existence in the U-NII-4 band with incumbents, including DSRC/ITS systems (many of which are based on IEEE 802.11 technologies). This will allow U-NII devices to operate across 200 MHz of spectrum either indoors or outdoors under the same power and emission limits, allowing 36 dBm EIRP with a 6 dB antenna, or up to 52 dBm with a 23 dBi antenna.

As a general matter, Ericsson believes that DFS should only be required where it is essential to protect incumbent systems from interference. Regarding Spectrum Sensing / DFS, Ericsson submits that it is unfortunate that previous actions by the Commission added requirements for devices operating in the U-NII-2A band to employ DFS at the time the requirements were added for U-NII-2C.

Ericsson requests that further study be undertaken to evaluate the need for DFS or other sensing technologies the U-NII-2B band. Further study should be undertaken to evaluate the ability of current DFS mechanisms to protect current and future radars that employ sub-microsecond pulses and to protect non-radar systems that operate in the U-NII-2B band. Current DFS mechanisms do not support sub-microsecond signals. Specifically, Ericsson recommends that any new DFS rules (1) do not retroactively apply to current bands and (2) limit DFS detection to above 0.5 microsecond until further studies are complete.

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<sup>18</sup> See *id.* at ¶ 96.

<sup>19</sup> See *id.* at ¶ 97.

Ericsson recommends that prior to adding DFS requirements in new U-NII bands, the Commission should—in addition to analyzing the degree to which DFS can protect incumbent devices—also evaluate the possibility of “false triggering” that disrupts U-NII device operation. This concern is particularly important when U-NII links are used for wireless backhaul applications. Specifically, Ericsson does not recommend that new radar types be considered, but if they are, the Commission must define with high accuracy the actual signatures to allow for more accurate detection and avoidance. Widening the current radar detection rules would most certainly lead to increased radar false detections, making these bands less suitable for uses like mobile broadband. The Commission should also seek ongoing alignment with ETSI rules in this area.

## **7. NTIA 5 GHz Report**

Ericsson respects the need to minimize risk to incumbent federal systems operating in the U-NII-2B and U-NII-4 bands. That being said, we believe that there is a balance to be struck in terms of minimizing interference to incumbents and making the band useful for new services.

We therefore offer the following observations:

- (1) If concerns about the reliability of sensing-based technologies (which require U-NII devices to identify unused spectrum by assessing and determining current use of a frequency, often at very low signal levels) can be addressed, then Ericsson would be generally in favor of using DFS/sensing techniques for U-NII infrastructure where applicable;
- (2) Ericsson would consider as an alternative approach, in appropriate U-NII bands, the use of geolocation-based technologies. These technologies will require the incumbent to develop a database to facilitate spectrum sharing and also require additional functionality in new entrants’ transceivers to accurately report their location (requiring manual configuration of indoor products) and search that database before using a given channel;
- (3) After further study to determine whether such technology is useful and viable, Ericsson would also consider the use of beaconing/pilot channel to be used by new entrants’

transceivers to determine channel availability. These technologies require incumbents to continuously send a signal alerting other users of their presence on a given channel.

In all cases, a reasoned balance should be struck, considering both the current and future operation of incumbent systems, while not excessively burdening ease of use and deployment of U-NII devices.

## **8. Other Issues**

Ericsson agrees with all the modifications proposed herein by the Commission for Sections 15.403, 15.407, 15.215 and 15.247.<sup>20</sup>

Ericsson also supports the Commission's proposed timetables for transition to the new rules, albeit with one exception: devices already installed or in use should be grandfathered for the life of the device, including any warranty or product-support periods.

## **CONCLUSION**

The addition of new spectrum in the 5 GHz range will lead to greater deployment of heterogeneous networks and consumer devices. Ericsson reiterates its request that the Commission move quickly to free up more spectrum in the 5 GHz band; certain aspects of the Notice are actionable in the near term and need not be delayed while further studies are performed.

Ericsson also requests that the Commission work with stakeholders outside of the U.S. to encourage the establishment of a globally harmonized band. Additionally, we suggest that policymakers support ongoing activities in the International Telecommunication Union regarding opportunities for licensed, mobile broadband services *above* 5.925 GHz.

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<sup>20</sup> See *id.* at ¶ 113.

Finally, we ask that the Commission not favor any one technology over another, and keep new U-NII rules technology neutral.

Respectfully submitted,

ERICSSON

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